

WHAT IS CLAIMED IS:

1           1. A LED of AlGaInP system, comprising:  
2           a substrate having conductivity,  
3           a n-type cladding layer formed of compound semiconductor  
4 of AlGaInP system,

5           an active layer formed of compound semiconductor of AlGaInP  
6 system having a smaller band gap energy than that of said n-type  
7 cladding layer,

8           a p-type cladding layer formed of compound semiconductor  
9 of AlGaInP system having a larger band gap energy than that of  
10 said active layer,

11           a p-type window layer formed of GaP,  
12           electrodes formed on predetermined portions of said window  
13 layer and said substrate, and

14           an insertion layer which is inserted between said p-type  
15 cladding layer and said p-type window layer and has a smaller  
16 band gap energy than that of said p-type cladding layer.

1           2. A LED of AlGaInP system according to claim 1, wherein:  
2           said band gap energy of said insertion layer is larger  
3 than that of said active layer.

1           3. A LED of AlGaInP system according to claim 1, wherein:  
2           a conductivity type of said insertion layer is p-type.

1           4. A LED of AlGaInP system according to claim 3, wherein:  
2           concentration of carriers in said p-type insertion layer  
3 is  $5 \times 10^{17} \text{ cm}^{-3}$  to  $5 \times 10^{18} \text{ cm}^{-3}$ .

1           5. A LED of AlGaInP system according to claim 1, wherein:  
2           said insertion layer is lattice-matched with said p-type

3 cladding layer.

1           6. A LED of AlGaInP system according to claim 1, wherein:  
2           said insertion layer is formed of AlGaInP, GaInP, AlInP,  
3 GaAs, AlGaAs, GaAsP or InGaAsP, which has such a composition  
4 that said band gap energy thereof is smaller than that of said  
5 p-type cladding layer.

1           7. A LED of AlGaInP system comprising:  
2           a substrate having conductivity,  
3           a n-type cladding layer formed of compound semiconductor  
4 of AlGaInP system,

5           an active layer formed of compound semiconductor of AlGaInP  
6 system having a smaller band gap energy than that of said n-type  
7 cladding layer,

8           a p-type cladding layer formed of compound semiconductor  
9 of AlGaInP system having a larger band gap energy than that of  
10 said active layer,

11           a window layer formed of  $Ga_xIn_{1-x}P$  ( $0 < x \leq 1$ ),  $Al_yIn_{1-y}P$  ( $0 < y$   
12  $\leq 1$ ) or  $Al_zGa_{1-z}P$  ( $0 < z \leq 1$ ),

13           electrodes formed on predetermined portions of said window  
14 layer and said substrate, and

15           an insertion layer which is inserted between said p-type  
16 cladding layer and said window layer and has a smaller band gap  
17 energy than that of said p-type cladding layer.

1           8. An epitaxial wafer for a LED of AlGaInP system,  
2 comprising:

3           a substrate having conductivity,

4           a n-type cladding layer formed of compound semiconductor  
5 of AlGaInP system,

an active layer formed of compound semiconductor of AlGaInP system having a smaller band gap energy than that of said n-type cladding layer,

a p-type cladding layer formed of compound semiconductor of AlGaInP system having a larger band gap energy than that of said active layer,

a p-type window layer formed of GaP, and

an insertion layer which is inserted between said p-type cladding layer and said p-type window layer and has a smaller band gap energy than that of said p-type cladding layer.

9. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

said band gap energy of said insertion layer is larger than that of said active layer.

10. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

a conductivity type of said insertion layer is p-type.

11. An epitaxial wafer for a LED of AlGaInP system according to claim 10, wherein:

concentration of carriers in said insertion layer is  $5 \times 10^{17} \text{ cm}^{-3}$  to  $5 \times 10^{18} \text{ cm}^{-3}$ .

12. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

said insertion layer is lattice-matched with said p-type cladding layer.

13. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

said insertion layer is formed of compound semiconductor

4 of AlGaInP, GaInP, AlInP, GaAs, AlGaAs, GaAsP or InGaAs, which  
5 has such a composition that said band gap energy thereof is smaller  
6 than that of said p-type cladding layer.

1 14. An epitaxial wafer for a LED of AlGaInP system  
2 comprising:

3 a substrate having conductivity,

4 a n-type cladding layer formed of compound semiconductor  
5 of AlGaInP system,

6 an active layer formed of compound semiconductor of AlGaInP  
7 system having a smaller band gap energy than that of said n-type  
8 cladding layer,

9 a p-type cladding layer formed of compound semiconductor  
10 of AlGaInP system having a larger band gap energy than that of  
11 said active layer,

12 a window layer formed of  $Ga_xIn_{1-x}P$  ( $0 < x \leq 1$ ),  $Al_yIn_{1-y}P$  ( $0 < y$   
13  $\leq 1$ ) or  $Al_zGa_{1-z}P$  ( $0 < z \leq 1$ ), and

14 an insertion layer which is inserted between said p-type  
15 cladding layer and said window layer and has a smaller band gap  
16 energy than that of said p-type cladding layer.

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1 15. A LED of AlGaInP system, comprising:

2 a substrate having n-type conductivity,

3 *Sub* a n-type cladding layer formed of compound semiconductor  
4 of AlGaInP system,

5 an active layer formed of compound semiconductor of AlGaInP  
6 system having a smaller band gap energy than that of said n-type  
7 cladding layer,

8 a p-type cladding layer formed of compound semiconductor  
9 of AlGaInP system having a larger band gap energy than that of

10 said active layer,  
11 a p-type window layer, and  
12 an insertion layer formed of compound semiconductor of  
13 AlGaInP system which is inserted into said p-type cladding layer  
14 or between said p-type cladding layer and said p-type window  
15 layer,  
16 wherein said insertion layer is lattice-matched with said  
17 p-type cladding layer, and a composition ratio of Al in said  
18 insertion layer is lower than that in said p-type cladding layer  
19 and higher than that in said active layer.

1 16. A LED of AlGaInP system according to claim 15, wherein:  
2 said p-type window layer is formed of GaP.

1 17. A LED of AlGaInP system according to claim 15, wherein:  
2 said p-type cladding layer and said p-type window layer  
3 are doped with Zn.

1 18. A LED of AlGaInP system according to claim 15, wherein:  
2 concentration of carriers in said insertion layer is  
3  $2 \times 10^{17} \text{ cm}^{-3}$  to  $5 \times 10^{18} \text{ cm}^{-3}$ .

4 19. An epitaxial wafer for a LED of AlGaInP system,  
5 comprising:

6 a substrate having n-type conductivity,

7 a n-type cladding layer formed of compound semiconductor  
8 of AlGaInP system,

9 an active layer formed of compound semiconductor of AlGaInP  
10 system having a smaller band gap energy than that of said n-type  
11 cladding layer,

12 a p-type cladding layer formed of compound semiconductor  
13 of AlGaInP system having a larger band gap energy than that of

14 said active layer,  
15 a p-type window layer, and  
16 an insertion layer formed of compound semiconductor of  
17 AlGaInP system which is inserted into said p-type cladding layer  
18 or between said p-type cladding layer and said p-type window  
19 layer,

20 wherein said insertion layer is lattice-matched with said  
21 p-type cladding layer, and a composition ratio of Al in said  
22 insertion layer is lower than that in said p-type cladding layer  
23 and higher than that in said active layer.

20. An epitaxial wafer for a LED of AlGaInP system according  
to claim 19, wherein:

said p-type window layer is formed of GaP.

21. An epitaxial wafer for a LED of AlGaInP system according  
to claim 19, wherein:

said p-type cladding layer and said p-type window layer are  
doped with Zn.

22. An epitaxial wafer for a LED of AlGaInP system according  
to claim 19, wherein:

concentration of carriers in said insertion layer is  
 $2 \times 10^{17} \text{ cm}^{-3}$  to  $5 \times 10^{18} \text{ cm}^{-3}$ .

Add  
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